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A REVIEW OF SOME RECENT EXPERIMENTAL WORK WITH DERRIS AND PYRETHRUM.

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During the past three years a great deal of attention has been paid to the use of derris and pyrethrum as basic, non-poisonous insecticidal material. This work was stimulated primarily by the tolerance placed upon arsenicals and other so-called poisonous insecticides. Considerable progress has been made and a number of formulae have been developed for the control of certain insect pests with the use of derris and pyrethrum that give safe, effective and economical kill. New applications are constantly being devised and it is the purpose of this paper to briefly review some of the newer developments in the field of derris and pyrethrum investigations.

Derris, used originally as a fish and arrow poison in the Old World, has found a very important position as a non-poisonous insecticide in the control of certain vegetable and cattle insect pests. In the control of vegetable insects, the usual recommendations call for a simple dust mixture of powdered derris root and some inert material, while in cattle insecticides, particularly in the control of cattle warble, mixtures of powered derris root and powdered neutral soap are recommended. These recommendations, while quite effective for the particular pests for which they are recommended, have not given the same control when extended over into the control of other insect pests. Further research has proceeded along the lines of the possibility of the use of sprays with the attending problem of suitable wetting and spreading agents, the use of various inert materials for dusts, the use of liquid extract of derris root and pyrethrum flowers, and many other possibilities.

Derris dusts containing .5 per cent, .75 per cent and 1 per cent rotenone, made by the dilution of derris root powder with some inert material, such as clay, talc, sulphur, tobacco, etc., have given adequate controls of insect pests, such as Mexican bean beetle, cabbage worm, asparagus beetle, cucumber beetle, melon worm, Colorado potato beetle, and a few others. Many growers are not equipped to make dust applications and as a consequence the problem of the formulation of derris sprays that will give the same measure of control as is to be found in the dust mixture, has been brought to the attention of the state, federal and commercial entomologists. As derris root powder is not water-soluble, the problem has become doubly difficult.

Water suspensions of powdered derris root have given a measure of control in Mexican bean beetle and cabbage worm work and have been recommended by the U.S.D.A. for several years. This recommendation calls for the use of two to two and one half pounds of powdered derris root, 4 per cent rotenone content, in fifty gallons (U. S.) of water. The writer finds that this rotenone content is inadequate for controls comparable to those found with powered derris

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root dusts, and controls were obtained only by the use of four pounds of powdered derris root, 4 per cent rotenone content, in fifty gallons of water. Clogging of spray nozzles also occasioned a great deal of difficulty.

Combinations of powdered derris root and soap powder for dilution in water, were abandoned due to the difficulty in securing pure, neutral soap. As the rotenone of the powdered derris root deteriorates in the presence of an alkali, ordinary soap used in spray work cannot be employed in combination with derris. The reaction of alkali and rotenone makes it virtually impossible for the grower to obtain satisfactory proprietary mixtures for dilution in water. If the powdered derris root and the powdered neutral soap can be mixed and used immediately at the time of spray application, fairly good controls can be obtained—certainly so in the control of the Mexican bean beetle.

Poor adherence was found with this spray application on the waxy surfaces of cabbage plants.

J. E. Dudley, Jr., of the U.S.D.A., working on pea aphis control (*Illinoia pisi*), found that powdered derris root, combined with one of several chemical wetting and spreading agents, for dilution in water, gave excellent promise of reasonable control of this very difficult insect pest. The work indicated the use of two pounds of powdered derris root, 4 per cent rotenone, with a commercial sulphated phenylphenol, one half pound of dry weight basis. This mixture for dilution in 100 gallons (U.S.) of water, and applied at the rate of 150 gallons per acre. Kills of nearly 100 per cent were obtained in greenhouse tests, and 90 per cent kills in summer field tests. Three to five days were required to obtain maximum kills and little or no reproduction was noticed in the interval.

This derris spray offers a convenient and economical spray procedure to supplement the dust schedule. The basic formula with some changes can be applied in the control of insects other than pea aphis, particularly the soft-bodied sucking type insects. The percentage of rotenone, as suggested by Dudley, has been found by the writer to be rather low and duplications of kills in summer field pests of 90 per cent kill requires the use of four pounds powdered derris root, 4 per cent rotenone content, with twelve ounces of the commercial wetting and spreading agent in 100 gallons of water. It will be found advisable to mix the required quantities of derris root powder and wetting and spreading agent together in a quart or so of water. This stock solution can then be canned or bottled and these containers taken directly to the field and introduced at that point into the spray tank.

A spray of this nature gave kills of 88 per cent on European red mite (pear and apple). Preliminary experimental work shows promise of control of leaf roller and red spider on strawberries, imported currant worm and aphis on currants, and aphis on spinach.

Considerable attention has been paid to a number of liquid extracts of derris, made up from soft or solid extracts with various solvents, such as acetone, alcohol, camphor sassafrasy and pine oil. As the derris extracts are not soluble in water, wetting and spreading agents must be added in order to combine them with water. A number of commercial wetting and spreading agents have been investigated and it has been found that sulphonated castor oil presents a

very efficient emulsification agent. The materials must be non-alkaline in nature. No formulae giving uniform results have as yet been found, although a great deal of further research is required before passing judgment.

A very promising lead in the derris extract work is suggested in the use of a liquid extract of derris in miscible pine oil. A spray of this nature is now being used and recommended in the state of New York for the control of tent caterpillar and juniper webworm. This derris extract contains approximately one half per cent rotenone, and is mixed one part in 50 parts of water.

The pine oil is effective in carrying the insecticide through the webs and wetting the bodies of the insects with the spray. This formula will be tried on a variety of insect pests in the near future. Pyrethrum flowers in the form of fine powder, or liquid extract in petroleum distillate base, have been used for a number of years in the household exterminating industry—roach powders and fly sprays. The agricultural use of these flowers is now expanding and is now recommended in the control of a number of insect pests, such as bean leaf hopper, celery leaf tyer, mushroom flies, cabbage looper and cranberry insects.

Pyrethrum agricultural dusts should carry pyrethrins content of .6 per cent. Such a dust may be obtained by the mixture of the standard, high test Japanese pyrethrum flowers .9 per cent to 1 per cent pyrethrins, with sulphur, clay or talc as diluent, in the ratio of 67 per cent pyrethrum to 37 per cent diluent. It is also possible to obtain a lower test pyrethrum powder containing .6 per cent pyrethrins. This material is used straight and undiluted. In either case the general application is 20 to 25 lbs. per acre.

Mushroom flies are very susceptible to pyrethrum, and in this field recent experimental work points to the use of a fine grade of English clay impregnated with pyrethrum extract, containing the extractive of 20 lbs. of high test Japanese pyrethrum flowers per gallon. Six quarts of this extract are incorporated into 100 lbs. of the clay. Ethylene dichloride presents the best solvent to carry the pyrethrum. The addition of rotenone to the pyrethrum extract will increase the toxicity approximately 10 per cent.

The pyrethrum extract impregnated dust is of interest in that the toxic principles of the pyrethrum flowers are liberated and on the outside of the diluent and not locked up within the plant tissues. Such a condition makes for quicker and more spectacular controls. However, such a dust is much more liable to deterioration through oxidation than the usual pyrethrum powder, and for this reason cannot be stored for any length of time. Where such a dust is to be used in the control of insects other than mushroom flies, it might be well to eliminate ethylene dichloride as the solvent, using a less volatile solvent such as a highly refined petroleum distillate.

In the United States the increasing infestation of blunt-nosed leaf hopper on cranberry bogs has seriously endangered the vast acreage of cranberries, particularly in the states of Massachusetts and New Jersey. The blunt-nosed leaf hopper carries false blossom which, if allowed to go unchecked, makes for a complete destruction of the cranberry bogs. Pyrethrum dusts and sprays have been used for some seven or eight years, and definite controls have been obtained. Early control work consisted of spraying with appyrethrum soap spray, but

it was soon found that soap was injurious to the berries and blooms. Later pyrethrum dusts were applied. These dusts consisted of ten pounds of powdered Japanese pyrethrum flowers .9 per cent pyrethrins with 90 lbs. of gypsum as a diluent. Later the percentage of pyrethrum powder was increased to 15 lbs. Last season the pyrethrum dusts were applied by airplane and auto-giro. In this method of application it was necessary to use the pyrethrum powder undiluted. The dust applications were also supplemented by the use of a pyrethrum spray consisting of pyrethrum extract and a high grade kerosene or petroleum oil, eight gallons per acre. The extractives of one pound of high test Japanese pyrethrum flowers were contained in each gallon of the oil. Although the tests were considered more or less as a preliminary experimental project, controls of 95 per cent to 100 per cent were obtained.

A tremendous demand is being felt for an efficient cattle fly spray. The markets have been flooded with hundreds of sprays that have, in many cases, utterly failed in their purpose, either through the ignorance of the manufacturers of the spray, or through a desire to produce a low cost item. A number of these commercial fly sprays on the market have been examined and fully 90 per cent are ineffective. The effective stock spray must embody the three primary principles of (a) immediate toxicity to insect present at the time of spraying (b) repellency value to further infestation of the animal (c) safety to the animal sprayed. The attainment of these three principles in one insecticide has presented a great deal of difficulty. However, intensive investigational work has shown that a spray based upon the following formula gives excellent results:—

Pyrethrum extract—containing three grams pyrethrums	1 gallon
Liquid extract derris, 5 grams rotenone per 100 cc. in pine oil	½ gallon
Pine oil—steam distilled	2½ gallons
Liquid petrolatum	2 gallons
Base petroleum oil	54 gallons
Specific gravity —0.820	
Saybolt viscosity —40.50	
100°F.	
	60 gallons

Definite information is now being assembled to show that derris root powder and pyrethrum powder are far more effective than the usual sabadilla, borax, sulphur and other commonly used cattle lice and flea powders. Either powdered derris root or pyrethrum powder may be used alone, although recent tests show that a combination of the two powders will give more desirable controls. A powder containing 10 per cent powdered derris root 5 per cent rotenone, 40 per cent powdered Japanese pyrethrum flowers, .9 per cent pyrethrins and 50 per cent talcum powder, will give adequate controls at a moderate cost. A greater percentage of derris root in the formula is likely to cause irritation to the mucous membranes of the animal treated. The irritating effect of the derris may be reduced somewhat through the use of powdered extract of derris.

In conclusion we might say that although a great deal of experimental data has been accumulated on the use of derris and pyrethrum as basic insecticidal materials, there still remains a tremendous amount of research work to be

performed, particularly in the control of insect pests where the poisonous insecticidal residue is not a serious problem. Relative to the comparative merits of derris and pyrethrum as insecticidal materials, we might say that pyrethrum is best suited to insect control problems where an immediate spectacular control is required, while derris would be indicated in those control problems where the time element necessary to obtain kill is not so important. Obviously the best features of both materials may be obtained from a combination of derris and pyrethrum.

A NEW RANCORA FROM THE MOHAVE DESERT (LEPID. NOCTUIDAE)*.

BY J. McDUNNOUGH,

Ottawa, Ont.

Rancora comstocki n. sp.

Male. Very similar to *serraticornis* Lint., but on the whole more contrastingly marked on the forewings, the light purplish-gray color being replaced by a whitish gray, heavily suffused with smoky; t. a. and t. p. lines poorly defined, much as in *serraticornis,* the former showing the usual sharp angle, outlined by a dark streak, above vein 1 and the latter in this same area with the usual small dark patch, closely approached to t. a. line and separated from it by a palish area. Rather heavy blackish suffusion in median area along inner margin. Orbicular and reinform better defined than in *serraticornis,* the former small, round, the latter lunate, both faintly centered with pale ochreous. In the terminal area the usual alternating pale streaks and dark arrow-marks and dashes are well-defined and much more prominent than in *serraticornis,* especially the streak above vein 1 which is separated from the t. p. line by a small triangle of pale color. Fringes smoky brown with whitish dots at termination of veins fairly distinct. Secondaries whitish with veins outlined in smoky and with slight terminal smoky shading, most prominent in the interspace between veins 4 and 6; a small dark lunate discal spot. Fringes whitish with slight smoky basal suffusion.

Female. Very similar to male but on primaries with rather more smoky suffusion in the entire median area, which serves to offset the pale streaks and shades of the terminal area. Secondaries rather evenly smoky with pale fringes. Expanse 45 mm.

Holotype— ♂, Yermo, Mohave Desert, Calif., Feb. 24, 1936, (G. Beevor); No. 4159 in the Canadian National Collection, Ottawa.

Allotype.— ♀, same data, in the Canadian National Collection, Ottawa.

Paratypes.—7 ♂, 10 ♀, same data, Feb. 24, 25, 1936; 2 ♂ ♀ in the Canadian National Collection, the balance in Coll. Comstock, Los Angeles, Calif.

I have much pleasure in naming the species after Dr. J. Comstock from whom I received the specimens for determination and through whose courtesy I have been enabled to retain the types in Ottawa.

I had at first surmised that the species might be *matricariae* Strecker, but through the courtesy of Mr. W. Gerhard of the Field Museum, Chicago, I have

*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture Ottawa.

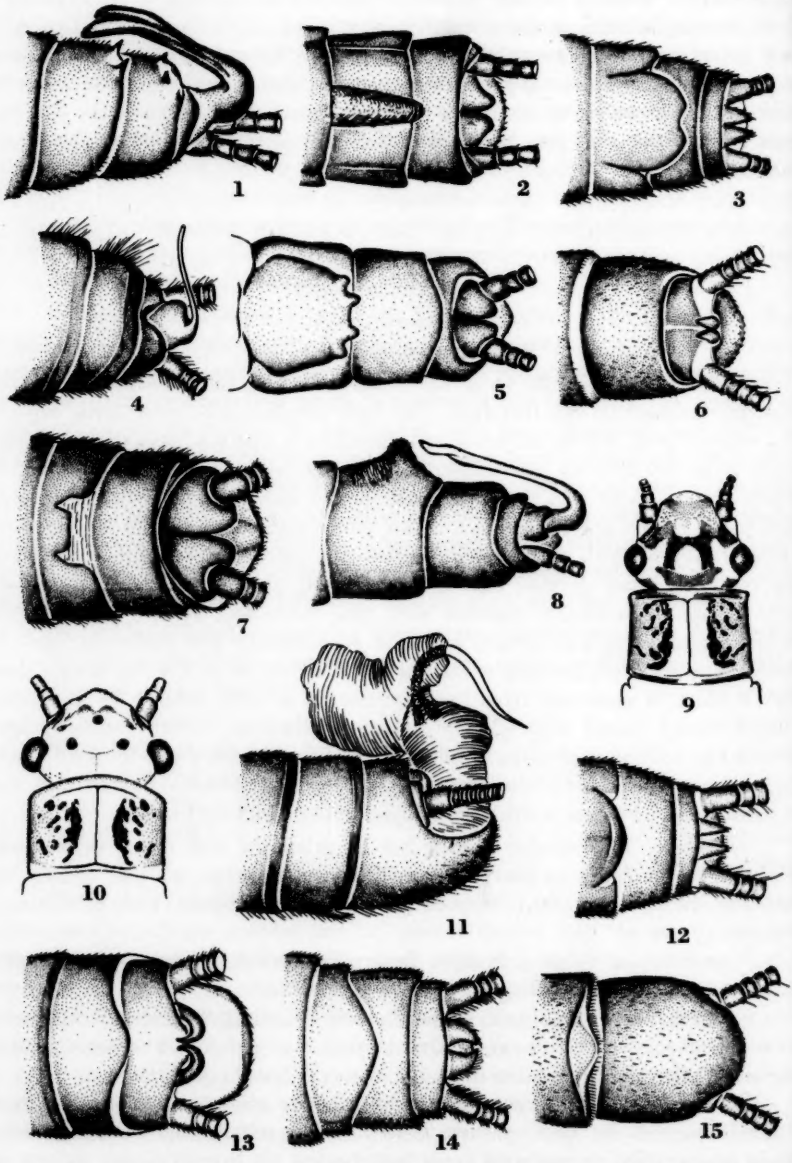

Fig. 1. *Capnia spinulosa* n. sp., male; Fig. 2. *Capnia spinulosa* n. sp., female; Fig. 3. *Isoperla extensa* n. sp., female; Fig. 4. *Capnia fumigata* n. sp., male; Fig. 5. *Capnia coloradensis* n. sp. female; Fig. 6. *Isoperla fulva* n. sp., male; Fig. 7. *Capnia fumigata* n. sp., female; Fig. 8. *Capnia coloradensis* n. sp., male; Fig. 9. *Isoperla fulva* n. sp., adult; Fig. 10. *Isoperla petersoni* Needham, adult; Fig. 12. *Isoperla petersoni* Needham, male; Fig. 12. *Isoperla fulva* n. sp. female; Fig. 13. *Isoperla petersoni* Needham, male; Fig. 14. *Isoperla petersoni* Needham, female; Fig. 15. *Isoperla fulva* n. sp., male.

been able to examine a photograph of the two original types of this species as well as Strecker's label, which places *matricariae* as a synonym of *serraticornis* and gives the type locality as San Francisco, Calif.; this synonymy is probably correct as Lintner's species came from the same region.

NEW SPECIES OF STONEFLIES (PLECOPTERA).

BY P. W. CLAASSEN,

Cornell University.

Herewith are described five new species of North American Plecoptera. Included also is a description of *Isoperla petersoni* Needham (nec Claassen). Dr. Needham[1] published figures of the nymph and adult of this species, anticipating that I would publish a description of this species before the Utah bulletin appeared in print. In 1931[2] I described the nymphs of this species as my own. Under the rules of the International Code, however, I believe that this species should now stand as indicated in this paper.

Capnia fumigata n. sp.

Plate 1, figures 4, 7.

Length to tip of wings, male, 13 mm.; female, 17 mm.

General color blackish with fumose wings. This species is closely allied to *Capnia grandis* Banks but differs in the structure of the supra-anal process which in *fumigata* is shorter and a little more slender than in *grandis*.

Male. Abdominal segments one to eight normal; ninth sternite somewhat produced, broadly rounded and very hairy; at the base of the ninth sternite a raised hairy area. Subanal lobes broadly rounded or almost truncate; tenth tergite cleft; supra-anal process slender and not reaching beyond the middle of the ninth tergite.

Female. Eighth abdominal sternite appears to be deeply cleft due to the non-sclerotization of the posterior portion of the sternite; the subgenital plate therefore ends at about the middle of the sternite, is cut straight across and on each side is notched because of non-sclerotization.

Holotype, male, *allotype* female, Alsea, Oregon, March 21, 1929, J. E. Davis (Cornell Entomological Collection).

Paratype, female, same locality. In the female paratype the subgenital plate is rounded rather than truncate but otherwise it agrees well with the female allotype.

Capnia coloradensis n. sp.

Plate 1, figures 5, 8.

Length to tip of wings, male, 5.3 mm.; female, 8 mm.

General color of alcoholic specimens reddish brown. Head slightly wider than pronotum; occiput with elongate rugosities; hind ocelli closer to eyes than to each other; antennae brown. Pronotum hardly wider than long; almost uniformly brown; somewhat widened posteriorly; wings uniformly subhyaline; legs brown. Cerci composed of 18 or 19 segments.

Male. Eighth abdominal tergite with a raised blackish transverse tubercle

(1) Needham, J. G. Economic Insects in Some Streams of Northern Utah, Utah Agr. Coll. Exp. Sta. Bull. 201:19, 1927.

(2) Classen, P. W. Plecoptera Nymphs of North America, p. 74, 1931.

which is finely granulate and anteriorly has a number of minute transverse ridges; ninth tergite with a narrow median depression; tenth tergite bifid; supra-anal process recurved, slender, gradually tapering but with a slight enlargement at the tips as seen from above and reaching to the tubercle on segment 8; ninth sternite slightly produced and rounded.

Female. Subgenital plate slightly produced and with four short lobes which are about as long as wide and about equidistantly placed on the hind margin of the subgenital plate.

Holotype, male, *allotype* female, Seven Falls, Colo., N. Cheyenne Canyon, August 3, 1921; (Cornell Entomological Collection). This species is similar to *C. elongata* from which it is easily distinguished by the fact that the tubercle in the male is on the *8th* tergite while in *elongata* the tubercle is on the *7th* tergite.

Capnia spinulosa n. sp.

Plate 1, figures 1, 2.

Length to tip of wings, male, 6.5 mm.; female, 7 mm.

General color dark brown; head a little wider than pronotum; antennae dark brown.

Pronotum wider than long; dark brown and moderately rugose; wings uniformly subhyaline; subcosta ends before the cord.

Male. Eighth abdominal tergite with two rearward directed spinelike tubercles on the posterior margin; also two small tubercles just beyond the middle of the *9th* tergite; supra-anal process composed of two recurved flattened processes, one lying directly above the other; both are sclerotized and the lower process is a little bit longer than the upper.

Female. Eighth abdominal sternite not produced except in the central portion. There is a sclerotized area which is produced rearward into a slightly rounded lobe.

Holotype, male, *allotype,* female, from Southern California. (Cornell Entomological Collection).

Isoperla fulva n. sp.

Plate 1, figures 6, 9, 12, 15.

Length to tip of wings; male, 11½-13 mm.; female, 14-16 mm.

General color yellowish brown and with lightly infuscated wings.

Head slightly wider than pronotum; a yellow spot in the ocellar triangle and each side between the eyes and hind ocelli; another yellow spot in front of the anterior ocellus; hind ocelli about as close to the eyes as to each other. Pronotum with a wide pale yellow median stripe; lateral discs darker and with dark brown rugosities. Costal margin of wings yellow, especially on basal half; rest of wings a little clouded.

Male. Eighth abdominal sternite with a broad knob; ninth sternite long and evenly rounded behind; subanal lobes recurved, roundly shaped and sharply pointed.

Female. Eight abdominal sternite produced into a broadly rounded or slightly angulate subgenital plate which reaches not more than a third across sternite nine. The subgenital plate at the tip is bent down away from the body. This is best noted in side view.

Holotype, male, *allotype* female, Logan River, Utah, June 17, 1926, J. G. Needham. (Cornell Entomological Collection).

Paratypes,—one male, four females, Logan River, Utah, June 15, 1926; eight males, same locality, June 17, 1926.

There seems to be some variation in the shape of the female subgenital plate. In some specimens the plate is drawn out more in the middle while in one female the tip of the plate is actually a little emarginate. All of these females agree, however, in coloration and in the downcurving of the tip of the subgenital plate.

Isoperla extensa n. sp.

Plate 1, figure 3.

Length to tip of wings, female, 10.5 mm.

General color pale yellowish with a V-shaped mark on head and with the discs of pronotum brownish. Hind ocelli are about twice as close to the eyes as to each other. Besides the V-mark connecting the ocelli, there is a little brown between the hind ocelli, but the coloring is not distinct enough to form the yellow ocellar spot common in many species of this genus.

Pronotum with a wide medium yellow stripe bordered by brownish rugose discs. Wings delicately hyaline and the veins light. Abdomen uniformly yellow.

Female. Subgenital plate produced over most of the ninth sternite and broadly notched.

Male. Unknown.

Holotype, female, Lincoln, Nebraska, June 25, 1934, D. B. Whelan (Cornell Entomological Collection).

This species resembles *I. 5-punctata* Banks, but the subgenital plate is larger and more deeply notched in this species.

Isoperla petersoni Needham

Plate 1, figures 10, 11, 13, 14.

Length to tip of wings, male, 4-4½ mm.; female, 5 mm. Length of body, male, 8 mm.; female, 9 mm.

This species is brachypterous in both sexes. General color yellowish to yellowish-brown. Head almost uniformly yellow except for the slightly darker lateral tubercles and frontal ridge; hind ocelli a little closer to the eyes than to each other. Pronotum slightly narrower than head; sides straight; surface yellow except for the rugosities and the median, frontal and posterior narrow lines which are brown. In the male the forewings reach only to the middle of the metanotum and the hind wings are no longer than the width of the metanotum. In the female both fore and hind wings reach to the first or even to the second segment of the abdomen.

Abdomen lighter at the base both dorsally and ventrally; posteriorly much darker.

Male. Hind margin of eighth abdominal sternite with a knob which is about as wide as long; ninth sternite much produced and truncate behind; subanal lobes recurved and rather sharply pointed; penis when extruded, large, fleshy and with a whip-like sclerotized process which is bifurcate at the base of attachment. The forked base of this process may be noted through the body wall of the

ninth sternite in males, when the penis is not extruded.

Female. Subgenital plate broadly rounded and produced over nearly half of sternite nine.

21 males, 5 females and many nymphs and nymphal skins, Peterson's Spring, Logan River, Utah, July 26, 1926, J. G. Needham. The types are in the Cornell Entomological Collection.

TWO TYPES OF VENATIONAL ABERRATION IN THE SATYRINAE.

BY LEIGH E. CHADWICK,
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About a year ago Mr. F. M. Brown called the writer's attention to the aberrant venation of one secondary of a specimen of *Erebia magdalena* Strecker. The aberration, of the type shown in Figure 1, consists in the presence of an extra cross-vein connecting veins R_5 and M_1 a few millimeters beyond the end of the cell. Later, in studying series of other species of the genus, a similar variation from the normal (Figure 2) turned up in several specimens. The facts are presented in the following table, in which the results of examination of some material from the genus *Oeneis* is also included.

Genus	species	number of specimens examined	number of specimens with extra cross-vein in secondary
Erebia	*epipsodea*	121	2
	theano	75	3*
	magdalena	20	3
	callias	8	0
	rossii	185	0
	European spp.		0
Oeneis	several North American spp.	250 approx.	1**

*all in a series of 40 *E. t. canadensis* Wrn.; one specimen with aberration of both secondaries.

***Oeneis chryxus.*

To the above may be added a record of the presence of this extra vein in one specimen of *Coenonympha haydenii* (Figure 5). This information, and the slide from which the figure was taken were supplied through the kindness of Mr. Demorest Davenport.

It is well known that there is considerable variation in the relative position of the veins which emerge from the cell, both in the Satyrinae and in other groups. This has often been attributed to environmental influences supposed to have operated on the pupa; the case is well demonstrated when these influences take the form of actual mechanical injury. In such instances the course of the veins may be variously altered, with resulting distortion of the form of the wing.

Possibly the aberration in question should be dismissed as falling into this category, in spite of lack of evidence one way or the other. However, its identical recurrence in a certain small percentage of several hundred specimens leads one to suspect that there may be some better explanation for it than mere chance.

Not one of the variant specimens shows any sign of injury; except for the presence of the extra vein, the wings are normal. If this repeated divergence is due, nevertheless, to what may broadly be termed 'pupal injury', it must point either to some specific weakness in that region of the pupa, or to some peculiarity of habit which exposes the pupa unduly at just that point in its structure.

Another possibility is that the aberration has a genetic origin. Though the samples listed above are too small to prove anything in this connection, they do show that the same variation is common to three genera within the subfamily. The solution of this question depends in part upon the accumulation of more data, and in part upon our interpretation of the presence of the additional vein.

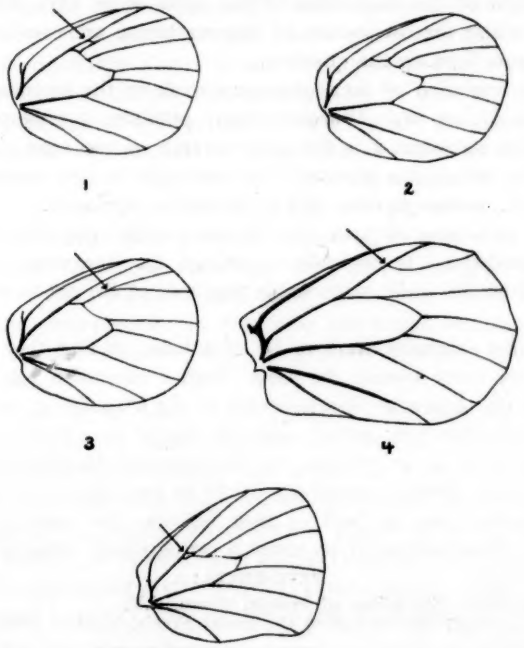

Figure 1. *Erebia theano canadensis.* Right secondary with extra cross-vein connecting veins R_s and M_1.

Figure 2. *Erebia theano canadensis.* Normal hind wing.

Figure 3. *Erebia theano canadensis.* Right secondary with stalking of M_2 on M_1.

Figure 4. *Oeneis chryxus* (?). Right secondary with stalking of M_1 on R_s.

Figure 5. *Coenonympha haydenii.* Right secondary with extra cross-vein connecting veins R_s and M_1.

It does not seem likely that this vein should have arisen adventitiously in each of the eleven instances here recorded, and the acceptance of such an explanation would still leave the question "Why?" totally unanswered. The situation is much more satisfactory if we can interpret it as a part of the basic venation which has varied from the normal course of development. Since the cell itself is perfectly and normally formed in every case, and the cross-vein lies beyond it, it would

seem that the third, fourth and fifth branches of radius are the only constituents of the basic venation available for its formation. These are commonly assumed to have united with the second branch throughout their length to form the definitive radial vein (R_s) of the frenate hind wing. (Comstock, '18, p. 334). According to that author, this condition has invariably been reached even in the pupal wing; the statement that it is the second branch of radius with which the others have coalesced must therefore rest purely on inference. It is at least conceivable that this should not always be the case, and that under some conditions the posterior branch or branches may instead anastomose with the first branch of media. Such a development would result in the type of aberration under discussion. Studies of the tracheation of the pupal wing have not been made on the Satyrids, where the difficulties of rearing larvae are considerable, but they might well throw light on the question.

Another variation of occasional occurrence in the secondary of *Erebia* is the stalking of M_2 on M_1. Warren (1936) publishes a photograph of such a variant with the note that it is the only instance of the kind known to him in the genus. The writer has observed this aberration in one specimen each of *E. t. canadensis*, *E. nereine tatsiana* and *E. melampus tigranes**.

A male of *Oeneis chryxus* (?) has the peculiar variation shown in figure 4 in both secondaries. It might be mentioned that the venation of the genus *Oeneis* appears on the whole more stable than that of the not-too-distantly related *Erebia*.

These five examples seem to be of a kind, in that they all represent a migration of the veins toward the costa. Such a migration has been made the explanation of the successive disappearance of the branches of radius in the secondaries of butterflies (*cf. supra*), and the degree to which it has progressed has been much used as a criterion for phylogenetic classification. Under this interpretation, these aberrant specimens would be regarded as farther along in the course of evolution than the bulk of their fellows. In contrast with this type, that previously discussed would represent a retrogressive tendency.

REFERENCES:

Comstock, J. H. (1918) The Wings of Insects, Ithaca, N.Y.
Warren, C. B. E. (1936) Monograph of the genus *Erebia*. London, 1936.

PHASMID INJURY TO THE HUMAN EYE.

BY M. A. STEWART,
University of California, Davis, California.

It has long been known that some of the Phasmidae discharge a fetid fluid from certain glands. King (1867) published a note on his observations of a phasmid in Jamaica, identified as *Anisomorpha buprestoides* (Stoll) but which Bates believed to be a true *Phasma*, in which he stated that the prothorax contains two glands, secreting a fetid fluid which is discharged through two elevated pores and serves as a defensive agent. This author further stated that these nocturnal, or crepuscular, and gregarious insects are almost always found in the adult stage in copulation. Scudder (1876), in a paper on the odoriferous glands in Phasmidae, described two pores, one in the antero-dorsal region of each side of the prothorax, which according to him were previously mistaken for stigmata.

*ident. Warren.

From these pores is emitted, by many species, an odoriferous fluid which is secreted in sacs termed *glandulae odoriferae*. These pores occur in both sexes and Scudder believed the secretion to be probably a means of defense.

The genus *Anisomorpha* is the only genus of Phasmidae in the United States furnished with such distinct odoriferous glands on the prothorax. We have two closely allied species belonging to this genus. *A. buprestoides* (Stoll) which apparently occurs most commonly in the extreme southern states and *A. ferruginea* (Palisot de Beauvois) which extends farther north than does *buprestoides*, but it also occurs in Florida and Louisiana. Caudell (1903) states that both *A. ferruginea* and *A. buprestoides* are "said to be able to throw a colored fluid to a considerable distance from the well developed scent glands, situated on the thorax" when excited or disturbed. Subsequent observations on the nature and source of the discharge vary. It has been reputed to be a milky fluid or a very fine mist and to be expelled from some part of the abdomen as well as from definite pores on the side of the thorax. McAtee (1918) published an interesting note on *Anisomorpha buprestoides* in which was reported an observation made in Manatee County, Florida, on June 19, 1918, where numbers of pairs of this species were found *in copula* in the interstices of a pile of boards in a deserted cabin. When these insects were suddenly uncovered, or otherwise disturbed, they discharged from the end of the abdomen "vapor in the form of small puffs appearing two inches from the abdominal apex." The observer stated that the discharge in each case was preceded by a peculiar crepitation similar to the crackling sound made by a small electric spark. This observation differs from all others previously recorded.

The discharge of an odoriferous fluid or vapor and the not uncommon confusion of phasmids with mantids have led to a popular belief in some parts of the United States that Phasmidae are very poisonous if eaten by live stock. For this reason they have been called mule-killers (though this name is more commonly applied to mantids), devil's riding horses, prairie alligators, witch's horses, devil's darning needles, scorpions, musk mares (Caudell's belief is that this name is applied only to the genus *Anisomorpha*), *campo mucho* (in the case of *Pseudosermyle truncata* Caudell), walking sticks and stick bugs.

Despite the fact that there are numerous recorded observations of a fluid or vaporous discharge from phasmids and that there are many reported instances of this substance striking the human eye, there is apparently no published account of its effect upon the eye of man, other than it has been vaguely reputed to cause blindness. In Texas there is a rather common belief that "devil's horses" will "spit" in human eyes.

The writer had the opportunity of receiving a first-hand account from a careful observer whose eye was injured by such a discharge in the Conroe Oil Field in Texas in July, 1932. The victim was observing a pair of *Anisomorpha buprestoides*, which were submitted with the report of the incident, *in copula*, with his face within two feet of the insects, when he received the discharge in his left eye. Apparently none of the secretion touched his face and his right eye was entirely unaffected. The phasmids had not been disturbed other than by removing the concealing bark from the tree and no motion of the insects was ob-

served. The discharge was not seen and unfortunately it is not known whether it came from the male or the female nor from what part of the insect's body. The pain in the left eye was immediately excruciating; being reported to be as severe as if it had been caused by molten lead. Quick, thorough drenching with cool water allayed the burning agony to a dull, aching pain. The pain eased considerably within the course of a few hours. Upon awakening the next morning the entire cornea was almost a brilliant scarlet in color and the eye was so sensitive to light and pressure for the next forty-eight hours that the patient was incapacitated for work. Vision was impaired for about five days. The cornea gradually cleared of congestion and vision improved so that at the end of this time the eye was perfectly normal again. No subsequent ill effects were experienced.

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THE BEES OF ALBERTA.—III.

BY T. D. A. COCKERELL,
Boulder, Colorado.

(continued from page 35)

Triepeolus helianthi Robertson. Lethbridge, Aug. 11 (G. A. Mail.) Described from Illinois, but known to be widely distributed.

Triepeolus stricklandi n. sp.

♀. Length about 8 mm.; black, including mandibles (except a dull red band in middle), antennae, tegulae (except red spot on outer side) and legs (except small joints of tarsi, which are red); eyes pale green, with a purplish suffusion below; pubescent markings pale cream-colour, pure white in region about antennae, the under side of abdomen without light markings; spurs black. Clypeus exposed, dull and granular, with sparse feebly impressed punctures, and a very feeble median raised line, only seen when the light is from the side; third antennal joint with a faint indication of a red spot; a shining spot laterad of each lateral ocellus; mesothorax dull, shining between punctures posteriorly; scutellum bigibbous, with shining bosses; axillae pointed, but little produced; anterior part of disc of mesothorax with a pair of light bands, anteriorly about as far apart as the length of one, their ends narrowly pointed, the front ends not reaching the transverse prothoracic band; marginal bands of mesothorax interrupted just above tegulae, not reaching anterior corners of mesothorax; outer surface of hind tibiae showing conspicuous spots on a silvery ground; wings dusky hyaline, with very dark stigma and nervures; second cubital cell triangular, greatly narrowed above, receiving first recurrent nervure about middle; first tergite with the transverse black band parallel-sided, broadly rounded (subtruncate) at ends; basal pubescent band of first tergite narrowly interrupted, but apical band continuous, but in middle notched in front and behind; pubescent bands of second tergite strictly entire, not notched, the anterior lateral extensions triangu-

lar; third and fourth tergites with bands like that on second; fifth with a very large triangular patch on each side; false pygidium forming an equilateral triangle, silvery in certain lights.

Lethbridge, Aug. 5, 1935 (E. H. Strickland). Type, No. 4172 in Canadian National Collection.

There is considerable resemblance to *T. pectoralis* Robertson, but it differs by the black legs, much narrower black band on first tergite (not pointed at sides), and the more densely (though coarsely) punctured lower part of the mesopleura. They nearly agree in the ornamentation of the mesopleura, with the lower half bare, but the transverse pubescent band is more feebly developed, failing on the posterior half. Another related species is *T. brittaini* Ckll., described from a male taken in Nova Scotia, but that has the mesopleura covered with hair, the under side of the abdomen with hair-bands, and the band on the second tergite interrupted.

Argyroselenis minima Robertson. Edmonton, July 29 (O. Peck). Described from Illinois.

Epeolus lutzi Cockerell. Delia, July 22 (Strickland). A variation with grey eyes, and the suffused bands on mesothorax more distinct. The forms of *Epeolus* deserve more minute study, but for their proper elucidation bred material will be almost necessary. Dr. O. W. Richards writes me that he has been studying the British *Epeolus* obtained from different *Colletes* hosts, and finds slight differences between the different forms. We seem to have the beginnings of specific differentiation.

Coelioxys ribis Cockerell. Beaverlodge, July 6 (O. Peck). Described from New Mexico, but extends northeast to Nova Scotia.

Coelioxys moesta Cresson. Wabamun, May 8 (Strickland). Female; compared with one from the Cresson collection, obtained in Colorado. The margins of the sternites are partly coppery red. The species is very widely distributed, and goes north to Yukon Territory.

Agapostemon texanus subtilior Cockerell. Females from Lethbridge, June 1 (G. A. Mail) and June 12 (Strickland); New Dayton, June 9 (Strickland); Gull Lake, June 8 (Strickland). Miss Sandhouse does not recognize this in her recent revision, but it is a valid race, smaller and with more shining mesonotum than in the typical form from Texas.

Xenoglossodes albertensis n. sp.

Female. Length about 10 mm., anterior wing about 7: eyes pale green, purplish at lower end; mandibles with a red subapical mark; clypeus densely punctured, with a slender shining median ridge; flagellum rather dull ferruginous beneath; hair of head and thorax long, rather dull white; with a hardly perceptible yellowish tint above; but the mesothorax posteriorly, except at sides, is highly polished, with thin black hair, and the scutellum has long black hair; tegulae shining black; wings hyaline, faintly dusky, stigma dark reddish, nervures black; legs with long pale hair, the long scopa on hind tibiae and basitarsi tinged with yellowish, but hair on inner side of basitarsi, and the brush at apex, rusty black; first tergite with long erect pale hair at base, and a short stripe of dense pure white hair at each side near margin; tergites 2 to 4 with broad bands

of dense white hair; fifth and sixth with black hair, some white hair projecting at extreme sides of fifth; spurs creamy white. Closely allied to *X. excurrens melanaspis* Ckll., differing thus: pubescence much whiter, the abdominal bands not yellowish; no band of pale hair between mesothorax and the highly polished scutellum; hind knee-plates black (orange in *melanaspis*); exposed area before band on second tergite shining; bands on third and fourth tergites narrower, the black (exposed) part before the band very distinct, though with some scattered pale hairs on third; hair of fifth tergite intense black; hair on inner side of middle and hind basitarsi black.

Milk River, Aug. 20, 1936, at flowers of *Peritoma serrulatum* (Pursh.), collected by Mrs. W. P. Cockerell. Type temporarily in my collection.

On the same flowers, at the same time, my wife took females of *Megachile perihirta* Ckll. and *M. manifesta* Cress.

Halictus lerouxii ruborum Cockerell. This is the western race, the females with the tegulae red or reddish, hind tibiae red or mainly so, hair at end of abdomen pale greyish or reddish. I have it from as far east as Fargo, North Dakota (Stevens) and Douglas County, Kansas (Snow). The males are not appreciably different from typical *H. lerouxii*.

The Alberta specimens are from seven localities: Edmonton (Peck, Strickland); Lethbridge, both sexes (Strickland); Beaverlodge (Peck, Strickland); Slave Lake, Aug. 25 (O. Bryant); Bilby, July 4 and 21 (O. Bryant); Gull Lake, June 8 (Strickland); Wabamun, male, Aug. 27 (Strickland). The abdominal bands vary in width, being in some cases as narrow as in the Californian *H. lupinelli* Ckll., which is better called *H. lerouxii lupinelli*.

The species belongs to a circumpolar type represented in Europe and Siberia by *H. rubicundus* (Christ. 1791.) The two forms are so close that various authors have considered them one species, as for instance Atwood, Canadian Journal of Research 10. Feb. 1934, p. 203. This may be the best thing to do, but a careful study should be made of the structural characters, using the various recognizable races. The typical *H. lerouxii* of Lepeletier, as I have it from Illinois (Robertson) and Garrison, N.Y. (Eleth Cattell), has in the female black hind tibiae and basitarsi, and very dark, nearly black, tegulae. Lepeletier says "anus rufovillosus," which might apply to the Illinois form, the caudal hair being somewhat reddish, as in the European *H. rubicundus*. The type *of H. lerouxii* was sent by Leroux from North America, no particular locality being given. Of the American races, *H. lerouxii ruborum* is nearest to the European *H. rubicundus*, and it might be best to unite *ruborum* with *rubicundus*, of which *lerouxii* and *lupinelli* would be subspecies. The face in female *H. rubicundus* is not so broad as that of *ruborum*, when European specimens are compared; but a Siberian specimen, which I collected at Ust Balei, has the face quite broad.

Halictus arcuatus Robertson. Bilby, 33 females, July 12, 14, 16, 20, 21 (O. Bryant); Edmonton, females April 27 (H. A. MacGregor) and June 20 (Strickland), and males Aug. 12 (Strickland); Wabamun, females July 6-11 (Strickland) and males July 7 and 31, Sept. 1 (Strickland).

The females differ a little from the typical (Illinois) forms in lacking or only feebly showing the pallid margin of the tergites, but this character is variable,

The males differ in a similar manner, and in the dark hind tarsi, though in one Wabamun specimen the hind basitarsi are dull whitish.

Halictus provancheri Dalla Torre. Oyen, Males Aug. 24 and 30, females Aug. 24 (O. Peck); Lethbridge, females June 1, 3 and 12 (G. Allen Mail and Strickland), one Lethbridge specimen has first tergite blue, in the others it is green; New Dayton, female June 9 (Strickland).

The species is variable, but males from Woods Hole, Mass., and Illinois, have dark hind femora, which is not the case with Alberta males, nor with one from Fargo, North Dakota (Stevens).

It is interesting to note that this species and the last have come from the east but have become slightly modified. Have we here examples of post-glacial evolution?

Halictus coriaceus Smith. Females from Fawcett, June 10 and 20 (Strickland); Edmonton, June 11 and Aug. 12 (Strickland); Wabamun, July 9 (Strickland) and Bilby, July 21 (O. Bryant). A common species in Northeastern America.

Andrena milwaukeensis Graenicher. Fawcett, females June 10 (Strickland). Described from Wisconsin.

Andrena lupinorum Cockerell. Lethbridge, female July 20 (Strickland). Described from Colorado.

Andrena vicina Smith. Fawcett, female June 20 (Strickland). A common species in N. E. America.

Andrena sigmundi Cockerell. Beaverlodge, female May 31 (Strickland). Described from Wisconsin.

Andrena multiplicata Cockerell. Beaverlodge, three females, June 11-28 (O. Peck, Strickland); Red Deer, female, July 22 (Strickland); Fawcett, female June 10 (Strickland); Wabamun, female July 1 (Strickland); and also two smaller specimens from Gull Lake, June 14 and 27 (Strickland). Described from Wisconsin. The width of the punctured ridge at base of second tergite varies, and some might be considered *A. multiplicatiformis* Viereck, which is probably not a valid species.

(to be continued)

NEW COLEOPTERA FROM WESTERN CANADA VI[1].

BY RALPH HOPPING,
Dominion Entomological Laboratory, Vernon, B. C.

LAMPYRIDAE.

Phausis nigra n. sp.

Length 5-7 mm. Elytra black with margins yellow-brown, prothorax with rather wide margins, brown, disc black with the usual pale apical spots common to the genus. Legs, antennae and ventral surface black. Antennae stout with the usual needle-like appendage to the terminal segment. Prothorax wider than long, the translucent areas irregularly shaped and rather large, the disc convex, black, with the central portion not punctate, shining, the margins reflexed as is usual in the genus. The hind angles of the prothorax are narrowly rounded.

[1]Contribution from the Division of Forest Insects, Entomological Branch, Dept. of Agriculture, Ottawa.

Holotype—Trinity Valley, B. C., VII. 5. 1929—No. 4176 in the Canadian National Collection.

Paratypes—6 Trinity Valley, B.C.; 5 Midday Valley, B.C.; 2 Fernie, B.C., and 1 Vernon, B.C. Paratypes in the Canadian National Collection, Academy of Sciences, San Francisco, and that of the author.

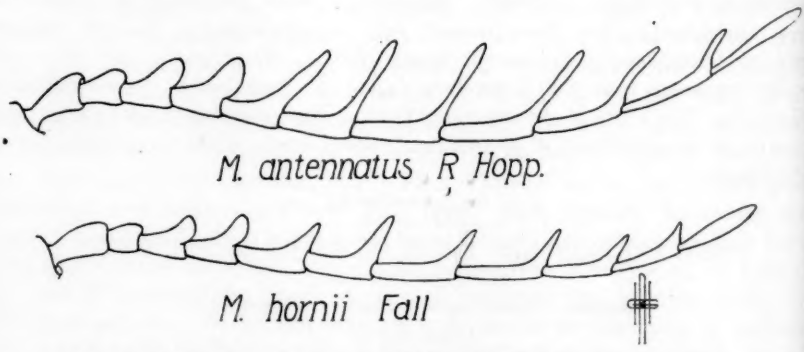
P. splendidula Linn. is a much larger species, *reticulata* has elytral carina, while *inaccensa* has the hind angles of the prothorax dentiform and is described as grey, not black.

P. nigra is nearest *riversi* l.ec., but differs in the pronotum being wider than long with the translucent spots much larger and impunctate, or only punctate towards the margins, while in *riversi* the spots are small, punctate and the prothorax is as long as wide and much narrower at the base than in *nigra*.

MELYRIDAE.

Malachius antennatus n. sp.

Male: length 4-5 mm. In color this species is exactly the same as *Malachius hornii* Fall, but averages smaller, especially the females. It is also more shining. The male antennae are pectinate and the elytra have appendages. The antennae however are radically different. The pectinations on segments 6 and 7 are longer than the segment, slender and constricted in the centre, while 6 and 7 of *M. hornii* are shorter than the segments and gradually expand toward the base. The pectinations of segments 9 and 10 on *antennatus* are fully twice as long as those on 9 and 10 on *hornii* and the terminal segment is much longer. The accompanying illustration drawn by George R. Hopping illustrates these differences.



Female: length 3.5 to 4.5 mm. The antennae are serrate, and, as usual, the elytra are without appendages. They are quite slender and shining, compared with the females of *M. hornii*.

Holotype—male, Vernon, B. C., VI. 2. 1921, R. Hopping, No. 4177 in the Canadian National Collection.

Allotype—female, Vernon, B.C., VI. 2. 1921, R. Hopping.

Paratypes—4 males and 12 females, all from Vernon, B. C., taken by R. Hopping and H. Richmond. Paratypes in the Canadian National Collection and that of the author.

Malachius hornii is represented in my collection by 9 males and 35 fe-

males. The male antennae all with short, stout pectinations, while those of *antennatus* are remarkably slender. The females of *antennatus* are more slender and more shining.

Atttalus smithi n. sp.

Length 2.5 mm. Black, shining. Antennae fuscous to the basal segments, which, with the mouth parts, are testaceous.

The head is shining, tri-impressed, eyes prominent, antennae subserrate. Prothorax shining, minutely punctured, and rather sparsely covered with short golden bristles. Elytra shining, widest just before the apex and broadly rounded to the suture, with sparse, short stiff bristles. Legs testaceous with posterior femora fuscous.

Male: Tip of the last abdominal segment deeply, narrowly emarginate. Antennae extending to the middle of the elytra.

Female: Tip of the last abdominal segment rounded and the antennae slightly shorter than the male.

Holotype—male, Sanca, B.C , VII. 7. 1933, G. Stace-Smith, 1900 ft. No. 4178 in the Canadian National Collection.

Allotype—female, same data, in the Canadian National Collection.

Paratypes—8 males and 8 females, Sanca, B. C., G. Stace-Smith.

Paratypes in the National Collection at Ottawa, the Academy of Sciences at San Francisco, the collection of Mr. G. Stace-Smith, and that of the author. These specimens were all caught in July on *Prunus emarginata* and occasionally on *Salix*, elevation 1900 ft. by my friend Mr. G. Stace-Smith, after whom I have named the species.

This species belongs to the group with black elytra. Five females out of a series of 24 before me have the apical part of the head as well as the mouth parts testaceous, but cannot be separated from typical specimens.

Specimens were submitted to Mr. H. C. Fall, who confirmed my opinion that they did not fit the description of any known species.

BOOK NOTICES.

"The Biological Control of Insects" by Harvey L. Sweetman, with a foreword by L. O. Howard; pages I-XII, 1-461, illustrations 142, glossary, table of references and index. Comstock Publishing Company, Ithaca, N.Y. Price $3.75.

This volume is intended "as a text book in courses in biological control, a reference work for the investigator and a general treatise for the use of all entomologists." The book is divided into fourteen chapters, the first entitled "The Theoretical Basis of Biological Control." Subsequent chapters deal with the use of resistent hosts, the use of bacteria, fungi, viruses, protozoa, nematodes, parasitic insects, predatory insects and spiders, biological relations of insect parasites and predators, factors to be considered in the utilization of insect parasites and predators, the introduction of insect parasites and predators, the use of predatory vertebrates, the results of biological control against animals, and a chapter on the biological control of pest plants.

In his opening chapter the author states, "while it is possible that one organism may not only control but eradicate another, our present knowledge of the fundamentals of biological control does not warrant undertaking eradication on a

commercial scale by the biological method," a statement with which undoubtedly those engaged in this particular phase of entomological activity will concur. This is followed by a brief resumé of the early history of biological control and a definition of terms, "biotic potential,' 'environmental resistance' and 'mathematical treatment.'

In the chapter on the results of biological control, the author tabulates examples of highly successful control, successful control, and examples still in the experimental stage. Some workers may not agree entirely with his conclusions in this regard. Towards the end of the chapter he indicates that he prefers to take a conservative attitude regarding the successful control of such pests as the European corn borer, gypsy moth, alfalfa weevil, etc. and states: "Certainly the data available do not warrant drawing final conclusions, or even suggesting that the introduced or native parasites and predators have succeeded materially in reducing the depredations of these pests."

The glossary while extremely helpful does not include terms which are defined in the text, and although these may be located by consulting the index, it might be considerably enhanced by the inclusion of terms which are used largely by those workers engaged in natural control projects. On the other hand, it does include such words as adult, aquatic, brood, cocoon, excrement, gills, habitat, larva, maggot, meteorological, ovum, pathology, progeny, ramify, spores, terrestial, and viscera, etc., terms which are generally understood by all biologists. The table of references will be extremely valuable to all interested in the subject. The illustrations are clear and well reproduced, although those who know W. R. Thompson as he is today, would have difficulty in recognizing him from the illustration on page nineteen.

This volume will be unquestionably of very great assistance to all those engaged in biological control as it brings together a mass of monographic literature on the subject, and as Dr. Howard says in his foreword, the need is great to bring up-to-date and summarize what has been done in this particular field. Different workers may not agree entirely with some of the conclusions of the author but that should not detract from the value of the book as a reference and summary of what has been already accomplished. The limited number of references to Canadian workers is a disappointment, in view of the great development of biological control in Canada during recent years. LEONARD S. MCLAINE.

"Der Schwammspinner in Euroasien, Afrika und Neuengland." by Dr. Karl E. Schedl. 246 pages, 95 text figures and 26 tables. Verlag Paul Parey. Berlin, 1936. Rm. 16.

A comprehensive critical compilation of the important research work which has been done on the gypsy moth in three continents, is a task requiring more than ordinary patience and ability. Dr. Schedl's excellent monograph is just that. This book will be of interest to Canadian entomologists not only because it contains much valuable and timely information, but also because its author is well remembered in this country as a former officer of the Dominion Entomological Branch.

Dr. Schedl has a thoroughly modern approach to his subject, both in the method of presentation and in the elaboration of the subject matter in which par-

ticular emphasis is laid on the experimental aspect of the various problems under discussion. At the beginning of the book, there is a short chapter on the systematic status of the gypsy moth. This is followed by an interesting account on the genetic aspects of intersexuality. The distribution, food plants, damage caused and other related questions, are treated at some length in the subsequent pages. The greater part of the work, however, is devoted to the life-history and habits of the species (pages 58-77) and more particularly to the analysis of the factors influencing the fluctuations in density of populations (pages 80-188). The latter subject is introduced by some considerations on the biotic potential of the gypsy moth, presented according to current concepts. The numerous factors, abiotic and biotic, representing environmental resistance are then discussed one by one. Disease and insect parasites, as control agencies, receive detailed treatment. The final chapter is devoted to artificial control.

Of special interest to Canadians is the statement (page 105) that, if the minimum isotherm limiting the probable spread of the gypsy moth lies in the neighbourhood of minus 20°F., then the only part of Canada in which the insect could maintain itself is a narrow strip along the Atlantic Coast and a small part of south Ontario and Quebec.

The list of references at the end of the book contains 600 titles and furnishes ample evidence of the painstaking care and the thoroughness with which the compilation has been made. It is to be hoped that Dr. Schedl's book may be the forerunner of many similar works on insects of economic importance. Ably written monographs, such as this one, will be most welcome to all practising entomologists. J. J. DE GRYSE.

Forest Insects by R. W. Doane, E. C. VanDyke, W. J. Chamberlin and H. E. Burke. 1936, McGraw-Hill Book Co., New York, 463 pp., 234 figs. Price $4.50.

This very useful work is intended as a text-book for students in Forest Schools, Colleges and Universities, and for Forest Workers; it presents for the first time a comprehensive view of the numerous insects in various orders injurious to forests and forest products with special attention to bark-beetles, and combines in a single volume a vast amount of information on the subject which has heretofore been scattered throughout numerous entomological publications. It comprises twelve chapters as follows:—Importance of Forest Entomology; The Control of Forest Insects, General Considerations; Bark-beetle Control; Control of Insects Injurious to Forest Products; The Beetles (3 chapters); Moths and Butterflies; Sawflies, Horntails, Bees and Ants; Aphids, Scale Insects and others; Other Orders of Insects and the Mites; Termites or White Ants. In two very handy Appendices the more important Coniferous Trees and Hardwood Trees of the United States with their principal Insect Enemies are listed. The copious illustrations should prove very helpful to all students of this important branch of Entomology.

Culture Methods for Invertebrate Animals. A Compendium prepared cooperatively by American Zoologists under the Direction of a Committee from Section F of the American Association for the Advancement of Science. 1937, Comstock Publishing Co., Ithaca, N. Y., 590 pp. Price $4.00.

The above mentioned committee, consisting of Paul S. Galtsoff, F. E. Lutz,

Paul S. Welch, under the chairmanship of J. G. Needham, has prepared a volume consisting of a compendium of articles on the rearing of invertebrate animals in practically every field of applied biology. This volume will not only serve the needs of teachers of biology in colleges and high school but prove a very useful reference volume for the specialized research workers in the fields of genetics, parasitology, experimental zoology, entomology and microbiology. The portion of the volume dealing with Insects comprises 257 pages and contains 161 short articles by well-known specialists on the rearing of a most diversified number of species, from tiny Collembola to the large Polyphemus moth; a wealth of information is contained in this portion of the work which should be indispensable to all workers engaged in this type of research.

Fragments of Entomological History by Herbert Osborn. 334 pp. and 47 Plates. Published by the Author. Columbus, Ohio, 1937.

In a delightfully informal manner the author deals with the development of Entomology in the United States and adjacent countries through the latter half of the 19th century to the present time. Due to his numerous contacts with the scientists of the earlier portion of this period he is able to furnish his readers with a number of interesting personal sketches of the entomological giants of that era, a feature which adds considerably, not only to the charm, but also to the usefulness of the work. The 47 Plates are largely devoted to portraits of well-known entomologists, past and present. J. MCD.

RESEARCH NOTES

NOTE ON MARTEN'S TYPES OF WESTERN HORSEFLIES

In this journal (Can. Ent. 67:92-95, 1935), I discussed the status of certain species of *Tabanus* described by Marten in 1882 and 1883, from the western United States stating ". . . the location of the types is unfortunately unknown." I have since been in touch with Dr. Marten through information kindly supplied by Dr. O. A. Johannsen of Cornell University. He is a practicing physician in Tolono, Ill., and writes "my specimens were burned in the fire that destroyed the Southern Illinois Normal School at Carbondale, Ill. in 1884 . . . I have done no work in entomology since I left the office of Prof. S. A. Forbes in 1894 . . ." He was unable to recall, on further inquiry, any closer details of locality from which his types came, than the states mentioned in the published descriptions. Since some future student may again raise the question of the whereabouts of these types, I offer this additional information while it is still available.

CORNELIUS B. PHILIP.

Hamilton, Montana.

FULGORIDAE (HOMOPTERA) TAKEN IN ALBERTA.

The species of Fulgorids, taken in Alberta, which have so far been recorded in literature appears to be limited to one—*Scolops hesperius* Uhl. (Entomological Record 1930)—taken at Lethbridge. We have, in addition, unpublished records of *Cixius cultus* Ball and *Pissonotus brunneus* V. D. determined respectively by J. H. McDunnough from Lethbridge and Brooks, and by G. S. Walley from Raymond. All of these localities are in the drier part of the province which lies in the Transition Life Zone.

Since this Family is essentially tropical to sub-tropical in its maximum

distribution, it did not appear to be unnatural that there were no records of captures in that part of Alberta which lies in the Canadian Zone and to the east of the Rocky Mountains even though, to the west of the mountains, the Family is represented to as far north as Alaska.

We were, therefore, rather surprised when, in 1929, we captured no less than four hitherto unrecorded species for the province at Gull Lake, which is well within the Canadian Zone about mid-way between the 52nd. and the 53rd. parallel.

In the same year, we received a small collection from the late Mr. F. S. Carr, which he had made at Medicine Hat and the Cypress Hills, in the Transition Zone.

With the aid of the excellent keys and illustrations by Metcalf in Research Bulletin I., North Carolina State College of Agriculture, we were able to name nearly all of the specimens with accuracy even though, up to the time of using these, we knew nothing about the taxonomy of this Family.

Dr. E. P. VanDuzee very kindly consented to check our determinations, all of which proved to be correct with the exception of one which had been marked (?). I can certainly recommend Metcalf's key to beginners.

Since this material was submitted to Dr. VanDuzee two or three further species have been captured at Edmonton, (north of the 53rd. parallel) and at Beaverlodge in the Peace River District (north of the 55th. parallel). These we have provisionally named ourselves.

The total list of Albertan Fulgorids now stands at twelve species, with three additional brachypterous species. It is as follows:— (Initials in brackets are those of determinors):

Scolops angustatus Uhl. Cypress Hills VIII (E.P.V.D.).
" *hesperius* Uhl. Lethbridge (Entomological Record).
Elidiptera pallida Say. Gull Lake VI. (E.P.V.D.).
" *septentrionalis* Prov. Gull Lake VI (E.P.V.D.).
Cixius basalis V.D. Edmonton VIII (E.H.S.).
" *cultus* Ball Lethbridge, Brooks V-VII (J.H.McD.).
Stenocranus dorsalis Fh. Edmonton, Wabamun VII-VIII (E.H.S.).
Pissonotus marginatus V.D. Medicine Hat VI (E.P.V.D.).
" *brunneus* V.D. Raymond (G.S.W.).
Laccocera vittipennis V.D. Medicine Hat VI (E.P.V.D.).
" sp. (Brachypterous) Beaverlodge. (E.H.S.).
Liburnia pellucida Fab. Gull Lake, Cypress VI. (E.P.V.D.).
" *campestris* V.D. Gull Lake VI. (E.P.V.D.).
" sp. (Brachypterous females) B'lodge, Edm. VIII (E.H.S.).
Criomorphus ? sp. Beaverlodge (E.H.S.).

All of the specimens which I have taken myself were captured when sweeping. One specimen of each of the species of *Elidiptera* recorded was taken in a single sweep of the net from sedges growing close to open water. Diligent sweeping in the same area on subsequent days and a year later failed to produce further specimens; in fact nearly half of the Fulgorid specimens in our collection were taken in three days' collecting at Gull Lake in 1929. E. H. STRICKLAND.
University of Alberta.

NEWS AND VIEWS

DOMINION DEPARTMENT OF AGRICULTURE TO MAKE DISTRIBUTION OF RUST RESISTANT WHEAT SEED.

After several years of exacting research work the Cereal Division, Experimental Farms Branch, Dominion Department of Agriculture, announces that it is now ready to make its first large-scale distribution of a rust resistant wheat variety to farmers in the rust-affected areas of the Prairie Provinces.

Dr. L. H. Newman, Dominion Cerealist, states that "the new variety, which has been named *Renown*, was developed under Dr. Goulden of the Cereal Division staff at the Dominion Rust Research Laboratory located at Winnipeg. The distribution will be made from the following points: Indian Head, Brandon, Portage la Prairie, Arborg, Dugald, Gilbert Plains, Gunton, Katrime, Petersfield, Plumas, Roblin, Silverton, Swan River and Pipestone, as long as the supply lasts." The amount available to any one applicant will be two bushels. Renown is not recommended at present for districts which are not subject to rust.

ANNUAL MEETING OF THE ENTOMOLOGIST SOCIETY OF BRITISH COLUMBIA

The annual meeting of the above Society was held on February 27th, 1937, at Vancouver, B.C. The following papers were presented:

1. Ectoparasites of Mammals and Birds in British Columbia: A Preliminary List of *Hippoboscidae* ..... G. J. Spencer
2. *Eriosoma crataegi* Oestlund and *Eriosoma lanigera* (Hausmann) ..... A. D. Heriot.
3. The Control of Thrips on Begonias ..... H. Andison.
4. Notes on a Weevil Attacking Wallflowers ..... W. Downes.
5. The Importance of Phenological Notations During Insect Ecological Studies ..... J. D. Gregson.
6. On the Function of the Pseudosternite in Male Locustid Genitalia ..... G. J. Spencer.
7. Foreword Upon Dragonflies ..... F. C. Whitehouse
8. Some Locality Records of British Columbia Dragonflies ..... E. R. Buckell.
9. Sun Spots and Insect Development ..... H. A. Richmond.
10. The Present Status of the Pea Moth in the Lower Fraser Valley ..... R. Glendenning.
11. Food Plants of Lepidopterous Larvae—List 5 ..... J. R. J. Llewellyn-Jones
12. Experiments on Control of the Hairy Spider Beetle ..... W. Downes & H. Andison.
13. Plant Inspection With Special Reference to Dock Routine ..... ". de Macedo.
14. Further Notes on the Woolly Aphis Parasite, *Aphelinus mali* Hald. .... E. P. Venables.
15. Notes on Some Phenomenal Feedings of Ticks ..... J. D. Gregson.
16. The Fleas of British Columbia.
    (a) Four New Species.
    (b) A Further Note on Fleas in Fuel Sawdust in Vancouver Residences. ..... G. J. Spencer.
17. Mass Collecting of Labia minor (Linn.), the Small Earwig ..... J. K. Jacob.

The following officers were elected for the year 1937:

Honourary President, L. E. Marmont; President, E. R. Buckell; Vice Pres. (Coast), G. J. Spencer; Vice Pres., (Interior), E. P. Venables; Secretary-Treasurer, G. R. Hopping; Auditor, J. W. Eastham; Advisory Board, W. Downes, J. W. Eastham, Geo. H. Larnder, J. R. J. Llewellyn-Jones, H. F. Olds.

Communications should be addressed to the Secretary, Mr. G. R. Hopping, Entomological Society of British Columbia, Vernon, B. C.

Mailed Saturday, May 8th, 1937.